

**PORLAND HARBOR SUPERFUND SITE
BIOACCUMULATION MODELING REPORT**

**APPENDIX E: EMPIRICAL TISSUE DATA
FOR THE MECHANISTIC MODEL**

EMPIRICAL TISSUE CONCENTRATIONS FOR THE MECHANISTIC MODEL

Site-specific tissue concentrations for all modeled chemicals were obtained from the project database. Average empirical tissue concentrations were compared to model-predicted tissue concentrations and used to evaluate model performance.

All tissue chemistry data for samples collected between River Miles 1.9 and 11.8 in the database were used to calculate site-specific tissue concentrations. Table 1 provides mean empirical concentrations for invertebrates; Table 2 provides mean empirical concentrations for fish species. Total PCBs were calculated as the sum of congeners when available and the sum of Aroclors when congeners were not analyzed for a given sample.

Table 1. Study Area-Wide Mean Empirical Tissue Concentrations for Field-Collected Invertebrates used in the mechanistic model

| Chemical | Clams | | Crayfish | |
|---------------------|---------------------|------------------|---------------------|------------------|
| | Detection Frequency | Value (µg/kg ww) | Detection Frequency | Value (µg/kg ww) |
| PCBs | | | | |
| Total PCBs | 41/41 | 230 | 17/32 | 68 |
| PCB 17 | 38/38 | 1.81 | 12/15 | 0.0518 |
| PCB 77 | 38/38 | 0.20 | 15/15 | 0.144 |
| PCB 118 | 38/38 | 7.03 | 15/15 | 4.45 |
| PCB 126 | 36/38 | 0.012 | 15/15 | 0.00857 |
| PCB 167 | 38/38 | 0.861 | 15/15 | 0.746 |
| Dioxins | | | | |
| 1,2,3,7,8-PentaCDD | 19/36 | 0.000211 | 15/15 | 0.000201 |
| 2,3,7,8-TetraCDD | 4/36 | 0.00018 | 15/15 | 0.000142 |
| Furans | | | | |
| 1,2,3,4,7,8-HexaCDF | 31/36 | 0.000517 | 14/15 | 0.00194 |
| 2,3,4,7,8-PentaCDF | 24/36 | 0.000759 | 15/15 | 0.00167 |
| 2,3,7,8-TetraCDF | 32/36 | 0.0025 | 15/15 | 0.00635 |
| Pesticides | | | | |
| 4,4'-DDD | 41/41 | 18 | 10/32 | 1.4 |
| 4,4'-DDE | 41/41 | 17 | 32/32 | 5.6 |
| 4,4'-DDT | 40/41 | 6 | 9/32 | 1.9 |
| Aldrin | 37/41 | 0.38 | 1/32 | 0.44 |
| alpha-HCH | 13/41 | 0.058 | 2/32 | 0.44 |
| beta-HCH | 1/41 | 0.17 | 0/32 | 0.44 |
| Dieldrin | 38/41 | 0.82 | 5/32 | 0.44 |

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Table 1. Study Area-Wide Mean Empirical Tissue Concentrations for Field-Collected Invertebrates used in the mechanistic model

| Chemical | Clams | | Crayfish | |
|--------------------|---------------------|------------------|---------------------|------------------|
| | Detection Frequency | Value (µg/kg ww) | Detection Frequency | Value (µg/kg ww) |
| gamma-HCH | 33/41 | 0.092 | 0/32 | 0.44 |
| Heptachlor | 19/41 | 0.059 | 0/32 | 0.44 |
| Heptachlor epoxide | 37/41 | 0.23 | 2/32 | 0.44 |
| Sum DDD | 41/41 | 25 | 10/32 | 1.6 |
| Sum DDE | 41/41 | 18 | 32/32 | 6.2 |
| Sum DDT | 40/41 | 8.4 | 21/32 | 3.9 |
| Total chlordane | 41/41 | 4.2 | 10/32 | 1 |
| Total DDx | 41/41 | 51 | 32/32 | 12 |

CDD –chlorodibenz-p-dioxin

CDF –chlorodibenzofuran

DDD – dichlorodiphenyl dichloroethane

DDE – dichlorodiphenyl dichloroethylene

DDT – dichlorodiphenyl trichloroethane

HCH – hexachlorocyclohexane

PCB – polychlorinated biphenyl

total DDx – sum of all six DDT isomers (2,4'-DDD, 2,4'-DDE, 2,4'-DDT, 4,4'-DDD, 4,4'-DDE and 4,4'-DDT)

Table 2. Study Area-Wide Mean Empirical Tissue Concentrations for Fish used in the Mechanistic Model

| Chemical | Sculpin | | Largescale Sucker | | Carp | | Smallmouth Bass | | Northern Pikeminnow | |
|---------------------|---------------------|------------------|---------------------|------------------|---------------------|------------------|---------------------|------------------|---------------------|------------------|
| | Detection Frequency | Value (µg/kg ww) |
| PCBs | | | | | | | | | | |
| Total PCBs | 38/38 | 690 | 6/6 | 880 | 15/15 | 2700 | 32/32 | 1100 | 6/6 | 870 |
| PCB 17 | 21/21 | 1.52 | na | na | 15/15 | 5.36 | 32/32 | 1.23 | na | na |
| PCB 77 | 21/21 | 0.281 | na | na | 14/15 | 0.239 | 32/32 | 0.463 | na | na |
| PCB 118 | 21/21 | 0.0251 | na | na | 15/15 | 26.7 | 32/32 | 30.9 | na | na |
| PCB 126 | 9/21 | 0.0363 | na | na | 9/15 | 0.0724 | 25/32 | 0.0562 | na | na |
| PCB 167 | 21/21 | 2.06 | na | na | 15/15 | 6.37 | 32/32 | 3.16 | na | na |
| Dioxins | | | | | | | | | | |
| 1,2,3,7,8-PentaCDD | 21/21 | 0.000501 | na | na | 15/15 | 0.00136 | 32/32 | 0.00136 | na | na |
| 2,3,7,8-TetraCDD | 21/21 | 0.000256 | na | na | 15/15 | 0.000707 | 32/32 | 0.000641 | na | na |
| Furans | | | | | | | | | | |
| 1,2,3,4,7,8-HexaCDF | 21/21 | 0.00437 | na | na | 15/15 | 0.00196 | 32/32 | 0.00171 | na | na |
| 2,3,4,7,8-PentaCDF | 21/21 | 0.00211 | na | na | 15/15 | 0.00243 | 32/32 | 0.00548 | na | na |
| 2,3,7,8-TetraCDF | 21/21 | 0.00867 | na | na | 15/15 | 0.00291 | 32/32 | 0.00636 | na | na |
| Pesticides | | | | | | | | | | |
| 4,4'-DDD | 31/38 | 20 | 6/6 | 54 | 15/15 | 55 | 32/32 | 42 | 5/6 | 33 |
| 4,4'-DDE | 31/38 | 45 | 6/6 | 120 | 15/15 | 130 | 32/32 | 110 | 6/6 | 250 |
| 4,4'-DDT | 33/38 | 71 | 5/6 | 59 | 10/15 | 3.4 | 27/32 | 31 | 1/6 | 11 |
| Aldrin | 10/38 | 1.1 | 0/6 | 2.5 | 9/15 | 1.2 | 15/32 | 1.1 | 0/6 | 4.2 |
| alpha-HCH | 7/38 | 0.86 | 0/6 | 2 | 9/15 | 0.78 | 15/32 | 0.86 | 0/6 | 3.1 |
| beta-HCH | 16/38 | 2.5 | 0/6 | 2.3 | 9/15 | 1.1 | 8/32 | 1.3 | 0/6 | 3.6 |
| Dieldrin | 26/38 | 4.9 | 0/6 | 3.8 | 9/15 | 2.7 | 19/32 | 4 | 0/6 | 5.2 |
| gamma-HCH | 15/38 | 1.5 | 1/6 | 2.8 | 9/15 | 1.2 | 12/32 | 1.1 | 0/6 | 3.9 |

Table 2. Study Area-Wide Mean Empirical Tissue Concentrations for Fish used in the Mechanistic Model

| Chemical | Sculpin | | Largescale Sucker | | Carp | | Smallmouth Bass | | Northern Pikeminnow | |
|--------------------|---------------------|--------------------------------------|---------------------|--------------------------------------|---------------------|--------------------------------------|---------------------|--------------------------------------|---------------------|--------------------------------------|
| | Detection Frequency | Value ($\mu\text{g}/\text{kg ww}$) | Detection Frequency | Value ($\mu\text{g}/\text{kg ww}$) | Detection Frequency | Value ($\mu\text{g}/\text{kg ww}$) | Detection Frequency | Value ($\mu\text{g}/\text{kg ww}$) | Detection Frequency | Value ($\mu\text{g}/\text{kg ww}$) |
| Heptachlor | 2/38 | 0.94 | 0/6 | 2.5 | 5/15 | 1.1 | 9/32 | 1.1 | 0/6 | 4.2 |
| Heptachlor epoxide | 12/38 | 1.2 | 0/6 | 2.1 | 9/15 | 0.96 | 18/32 | 1 | 0/6 | 3.5 |
| Sum DDD | 31/38 | 25 | 6/6 | 67 | 15/15 | 75 | 32/32 | 52 | 5/6 | 40 |
| Sum DDE | 31/38 | 47 | 6/6 | 120 | 15/15 | 130 | 32/32 | 120 | 6/6 | 260 |
| Sum DDT | 34/38 | 89 | 5/6 | 73 | 10/15 | 6 | 27/32 | 38 | 2/6 | 29 |
| Total chlordane | 26/38 | 9.5 | 2/6 | 11 | 12/15 | 13 | 20/32 | 10 | 0/6 | 6.4 |
| Total DDx | 38/38 | 160 | 6/6 | 270 | 15/15 | 210 | 32/32 | 210 | 6/6 | 330 |

CDD – chlorodibenzo-p-dioxin

CDF – chlorodibenzofuran

DDD – dichlorodiphenylchloroethane

DDE – dichlorodiphenylchloroethylene

DDT – dichlorodiphenyltrichloroethane

HCH – hexachlorocyclohexane

PCB – polychlorinated biphenyl

total DDx – sum of all six DDT isomers (2,4'-DDD, 2,4'-DDE, 2,4'-DDT, 4,4'-DDD, 4,4'-DDE and 4,4'-DDT)